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Preface

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PREFACE

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This special issue of the *Journal of Toxicology and Environmental Health* focuses on the assessment and management of the health risks associated with prolonged residential radon progeny exposure. Radon gas is a naturally occurring, odorless, and colorless noble gas released from the decay of radium-226. The radiologic significant exposures from radon come mainly from two of its alpha-producing decay products, polonium-218 and polonium- 214. Underground miners exposed to high levels of radon progeny (radon) have demonstrated an increased lung cancer risk, raising questions about potential lung cancer risks at the lower concentrations of radon exposure typically found in homes. Historically, risks projections for residential exposure were based on extrapolations from underground radon-exposed miners, assuming a linear relative risk model. However, there was concern among some scientists that differences between the mine and residential environment may limit the generalizability of risk estimates based on miner data.

The U.S. National Research Council Committee on the Biological Effects of Ionizing Radiation (BEIR VI) committee pointed out that the most direct way to assess the association between prolonged residential radon exposure and lung cancer was through the use of case-control studies of individuals residentially exposed. However, the ability to detect a dose-response relationship in residential case-control studies is hampered by the difficulty of reconstructing past radon exposures. In fact, the BEIR VI committee attributed much of the inconsistency between the individual residential radon case-control studies' risk estimates and the uncertainty in radon exposure reconstruction between studies. Not surprisingly, the findings of the pooled analyses presented in the special edition note that utilizing more stringent exposure assessment criteria increased the observed risk estimates.

The publication of this special edition marks a milestone for North American residential radon studies. The North American investigators began planning for the combined analysis in 1989, and subsequently worked together to prepare the data in a common format for analysis. The first North American residential radon case-control study was reported in 1990 by investigators

from New Jersey. The inclusion of the findings from the Connecticut and Utah/Southern Idaho study within this special edition finalizes the publication of all the large-scale residential case-control studies performed in the North America.

The special issue contains an introduction prepared by Dr. Jonathon Samet, who served as chair of the U.S. National Research Council Committee on the Biological Effects of Ionizing Radiation (BEIR VI), focusing on the health effects of radon, particularly lung cancer risks. This introduction traces the evolution of the epidemiologic evidence of increased lung cancer risk first observed in cohort studies of underground miners occupationally exposed to radon to more recent case-control studies of residential radon and lung cancer.

The second section of the special issue, North American Residential Radon Studies, includes a combined analysis of the seven large-scale case control studies conducted in North America. Individually, the point risk estimates from the studies provide conflicting evidence regarding the excess lung cancer risk associated with residential radon exposure. Collectively, the combined analysis provides direct evidence of an increased lung cancer risk associated with the estimated long-term residential radon exposure. The second section also includes an overview of the North American residential radon studies, along with the major findings paper for the Connecticut and Utah/Southern Idaho study.

The third section of the paper, Radon Risk Assessment, includes five papers related to exposure measurement error, radon dosimetry, and epidemiologic methods. The fourth section of the paper, Radon Risk Management, includes reports on two recent workshops sponsored by Health Canada and the World Health Organization, respectively, both of which address the important topic of residential radon risk management.

Where do we go from here? The North American and European residential radon datasets are currently being merged in an ongoing global combined analysis. The global pooling will also include data from two residential radon case-control studies performed in China. This collaborative effort between the North American and European investigative teams will provide the most comprehensive direct assessment of residential radon lung cancer risks possible based on currently available epidemiologic data.

Investigators from the United States are also working to complete calibration of a novel glass-based retrospective radon progeny detector. The new detectors estimate retrospective residential radon progeny exposure from the accumulation of a long-lived radon decay product, ²¹⁰Pb, in glass items such as picture frames. The use of this detector eliminates the need for imputation of missing radon data for past homes that could not be measured since it can measure the accumulated ²¹⁰Pb in glass pieces that have been carried from one home to another. A future global pooling is planned for residential radon studies that used glass-based retrospective radon detectors to determine historic residential radon progeny exposures.